An Overview of Conch Restoration Priorities for Lac Bay, Bonaire

Robert Glazer
Marathon, FL 33050
bob.glazer@gcfi.org
305-942-1814

Introduction

From 18 April 2011 through 22 April 2011 I visited Bonaire to meet with Sabine Engel and associates with STINAPA to discuss conch recovery within Lac Bay. This brief outline represents my impressions of the area in and around Lac Bay and presents a plan of action relative to restoring the population. The outline is organized by themes which focus on specific questions that, when taken together, form an ecosystem-based approach to understanding the population and forming specific strategies for a restoration plan. There are a number of subjects that cross themes including the importance of historical information and education. In fact, these two subjects formed an additional two themes in original conversations i n Bonaire but, because of their cross-cutting importance, have been woven into each theme and thus are not standalone themes.

This summary represents an overview of Lac Bay with some specific recommendations; however, a detailed analysis of Lac Bay including specific research projects is beyond the scope of this summary.

Impressions of Lac Bay

The obvious first impression when entering Lac Bay near Lac Bay is that there must have been an enormous amount of conch to support the large conch middens that are present. The middens also serve to suggest that Lac Bay once supported a substantial adult conch population. Unfortunately, I learned that the middens had been disturbed after recent storm events. Otherwise, a careful excavation of the middens could have provided a historical record of how the population changed over time. Nevertheless, it was obvious that Lac Bay once served as a significant center of conch fishing in Bonaire.

Theme 1: What is the Source of the Larvae Recruiting to Lac Bay

Background: Larvae recruiting into Lac Bay may come from either local or remote, upstream sources. It is important to discern the origin of the larval sources because management strategies will be very different depending on the source. For example, if the predominance of larvae are derived from upstream sources, then it is not critical to ensure that the local spawning stock of conch are protected. Alternatively, if the larvae are derived mostly locally, then it is absolutely essential that the conch that are spawning in Bonaire and, especially close to Lac Bay, are protected.

Research Required: There are a number of ways that the answer to the origin of larval recruits can be elucidated. These range from the very expensive (genetic studies) to fairly inexpensive (plankton trawls and drift vials.) In any case, a thorough understanding of the currents and hydrographical patterns will help inform the ultimate determination of the origin of Lac Bay's larval

conch.

Recommended Approach

Plankton surveys: plankton surveys can help discern larval origins because conch can easily be aged microscopically. In general, it is most instructive if the conch larvae that are collected are put within bins that indicate 'early stage ~1-6 days; 250 microns to 600 microns), mid-stage (~7-12 days; 650 microns to 900 microns) and 'late-stage' (>12 days and > 900 microns.) The benefit of this approach is that putting together a spatial 'map' of the size distribution of larvae can help explain if there are a lot of locally produced larvae (high densities of 'early-stge' larvae in the trawls); if the larvae are retained (a lot of 'eraly-stage larvae' and a lot of 'mid-stage' larvae. If there are a lot of 'late-stage' larvae but few early and mid-stage larvae', than it is likely the larvae are coming from elsewhere. However, simply conducting plankton survey within Lac Bay will not be sufficient to determine the true source of larvae because the patterns inside the Bay, outside the Bay, and further towards Isla La Aves will provide a true picture of the distribution and origins of larval conch. Therefore, it is recommended that a larval survey program is conducted.

Theme 2: Improve Larval Supply

Background: At this time, it is unknown whether the conch population is limited by 1) larval supply and recruitment, 2) habitat degradation, and/or 3) illegal harvesting. Any steps that can be taken to address all three would be useful. To address the supply issue, it is recommended that a number of egg-masses are transplanted into Lac Bay from conch that are spawning outside of Lac Bay and that these egg-masses are collected preferably a substantial distance from Lac Bay instead of, for example, in White Hole. The theory behind the approach is that larval supply is limiting but, ultimately it will be difficult to 'prove' that this approach is causing changes, even if there are dramatic increases in the population. Additional plankton tows over future years in the same areas as proposed in Theme 1 may help tying together any population increases to increased larval production and supply occurring inside Lac Bay. Nevertheless, for the amount of effort that is required to conduct this program and the potential benefits, it could prove to make a substantial difference.

Additionally, increasing the abundance and density of adult conch either inside Lac Bay (in appropriate habitats) or in White Hole may enhance larval production by the native population. Adding conch from outside the area will both increase the abundance, but, also increase disnities which is critical for per capita reproductive output (i.e., higher densities results in more reproduction by each female.)

Research Required: The success of this approach is dependent upon larvae being retained in Lac Bay for the duration of the larval cycle (~18 days), and that they settle in suitable settling habitat. It is difficult to assess the efficacy of this approach because changes in the population may or may not be related to this work. However, research into the currents that may facilitate retention inside Lac Bay (i.e. where are there eddies and how long are they in place) may help to determine the locations where the egg masses should be transplanted to that will ensure the maximum probability that larvae will be retained.

Additional plankton surveys coupled to the translocation of the egg masses will help provide information on the increase of larval supply in Lac Bay, especially when compared with outside Lac Bay and further compared with conch larval demographics (i.e. conch larval age) and densities prior to translocating the egg masses.

Theme 3: Understand the Habitat Requirements for Juvenile and Adult Conch in Lac Bay

Background: The carrying capacity of conch within Lac Bay will ultimately depend on the quality of habitat. There are a number of habitats within Lac Bay and, according to historical accounts, most

of them were occupied in the past. However, there are locations now where conch are no longer present or present in very small numbers (the northwest and southwest parts of the Bay.) My cursory examination of the bottom habitat in the upper parts of the bay suggests that the benthic substrate is indicative of relatively poor water circulation resulting in deposition of fine particles. This type of habitat, even in seagrass, is not favorable for conch – they prefer courser sand in sparse sea grass. This is also consistent with the recent overgrowth of mangroves and reduction of water flow through the Bay. Any proactive approaches, which already are occurring, that will increase water flow through the Bay will be helpful for conch populations although the changes will be slow and may take a years to occur.

Other impacts in La Bay are likely cause by direct human use. According to Roberto Hensen, juvenile conch were often found in high numbers in the area that is now utilized by windsurfers. The red coralline algae found in the shallow areas adjacent to the windsurfing concession is ideal settlement habitat for conch. The fact that much of it is now partitioned from is access is likely a very good thing. However, if this is a high settlement area, and the conch migrate ontogenetically across the channel as they age, then they are still exposed to high impacts from windsurfers walking in the shallows. The same is also true for snorkelers as they walk from the windsurfer concession to the reef for their snorkeling adventure.

Finally, nutrification of the Bay and runoff into the Bay from a number of sources should be addressed. The complete loss of bottom cover due to grazing goats needs to be addressed. Perhaps catchment basins to clarify the water can be constructed upstream from the mangroves adjacent to Lac Bay.

Research Required: Understanding the reasons that Lac Bay historically supported large conch populations will help with determining what habitat recovery plans will be most suitable. This is best achieved with thorough review of previous reports, and personal interviews with individual (including fishers) who were familiar with Lac Bay. The conversation should also include discussions on changes to the habitats, water flow and circulation. For example, how did the water flow change after the channel at the mouth of Lac Bay closed?

Additionally, an emphasis needs to be placed on understanding habitat suitability for the conch that are there. A significant question is do conch that mature in Lac Bay stay in Lac Bay, and do those that settle in the upper bay migrate towards the reef part of the Bay for reproduction. Acoustic tagging of conch will yield the answers to this question. This is a perfect opportunity to engage the community with both an education campaign and perhaps in assisting with the research.

Theme 4: Increase Adult Conch Abundance in Lac Bay

Background: Historical evidence as evidenced by conch middens, written reports, and anecdotal information demonstrates that Lac Bay likely once contained substantial populations of adult (reproductive-sized) conch. However, there are few conch within Lac Bay that are now sufficiently old to reproduce and this may be due to a number of factors including lost of suitable habitat for settlement and to support adults preferences. However, it is very obvious that poaching is a significant factor in the severely limited number of adult conch.

What is not known is whether the adult conch ever reproduced within Lac Bay. I think it is reasonable to assume that they once did and this forms the basis for a lot of this program. The recovery of the adult population will be critical if the population is ever to become self-sustaining; however, the results of the plankton trawls must indicate that local stocks are the likely supply for the native population. In lieu of this evidence, the increase of the adult population at this time is not absolutely necessary to begin restoration of the population because, in essence, translocating egg-masses serves the same function. Furthermore, restoration of the adult population will depend on a reduction of illegal conch fishing. It is obvious that conch fishing still continues (see picture). Therefore, I suggest that the recovery of the adult population should be approached as a long-term

goal because 1) the population can be jump-started using egg-masses, and 2) the recovery will require a great deal of commitment to education and enforcement.

The Ability of Lac Bay to Recover

Even if all the approaches suggested in this outline are implemented, there is no guaranty that recovery of the population will occur. A number of risks may still limit the recovery. These include:

1. The source of larvae is distant to Bonaire (e.g. Venezuela – Las Aves) and management/enforcement there may be poor. Thus, larval supply from upstream sources may be limited by insufficient protection of those stocks.

2. Poaching may still seriously reduce the ability of the local population to recover. Poaching is obviously a significant problem. Given the small area of Lac Bay and the numerous points of access, it is likely that poaching will remain a problem unless there is a sufficient, and high profile effort to eliminate it. A relatively small number of fishers illegally harvesting conch may reduce the population in a few nights of harvesting.
3. Habitat recovery may be prolonged given the likely slow nature of flushing in the upper part of the Bay and the additional; sources of pollutants from upstream..